Articles

Effect of Preoperative Suggestion on Postoperative Gastrointestinal Motility

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Autonomic behavior is subject to direct suggestion. We found that patients undergoing major operations benefit more from instruction than from information and reassurance. We compared the return of intestinal function after intra-abdominal operations in 2 groups of patients: the suggestion group received specific instructions for the early return of gastrointestinal motility, and the control group received an equal-length interview offering reassurance and nonspecific instructions. The suggestion group had a significantly shorter average time to the return of intestinal motility, 2.6 versus 4.1 days. Time to discharge was 6.5 versus 8.1 days. Covariates including duration of operation, amount of intraoperative bowel manipulation, and amount of postoperative narcotics were also examined using the statistical model analysis of covariance. An average savings of $1,200 per patient resulted from this simple 5-minute intervention. In summary, the use of specific physiologically active suggestions given preoperatively in a believable manner can reduce the morbidity associated with an intra-abdominal operation by reducing the duration of ileus.

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Numerous studies attest to the value of psychological preparation for patients undergoing major and minor surgical procedures.[1,2] A variety of presurgical psychological interventions have been employed, with varying degrees of success. In this study we contrasted the use of specific instructions for the return of physiologic functioning with the more common practice of offering preoperative reassurance and information about what to expect after the operation.

Postoperative ileus is a natural consequence of intraperitoneal surgical manipulation and results in a cessation of intestinal movement and digestion.* A lack of motility necessitates abstaining from the oral intake of both liquids and solids until gastrointestinal activity returns. This may take as long as four or five days after an abdominal operation.[3]

Autonomically innervated organ systems such as the gastrointestinal system are amenable to instrumental learning.[4,5] Learned responses have been clearly demonstrated in the gastrointestinal system in a series of experiments by Miller and Banuazizi using curarized rats rewarded with electrical stimulation of the median forebrain bundle.[6] These investigators used rats paralyzed with tubocurarine who were artificially ventilated to control for possible skeletal muscle influence. They found that these rats could change the motility of their colon in the desired direction, either increased or decreased from baseline, when rewarded with pleasurable electrical brain stimulation.

There is also evidence of visceral learning in humans.[7-11] Several studies were reviewed by Miller[12] regarding gastrointestinal functioning, such as that of White and Taylor,[13] who reduced the frequency of ruminative vomiting in two mentally retarded children using electric shock as a punishment at the first sign of muscle activity involved in emesis. Schuster and colleagues taught patients to increase pressure in the lower esophageal sphincter by displaying the pressure to them and rewarding them for increases.[14] Schuster used instrumental learning to teach 40 patients to control fecal incontinence.[10] Patients watched by polygraph the increase and decrease of pressure in the internal sphincters. Of the 40 patients, 28 achieved either a complete disappearance of incontinence or a decrease in frequency of at least 90%.

In general, surgical preparation studies that aim only to provide information or to "reduce stress" or anxiety have minor or equivocal results.[15-18] The assumption of the model appears to be that giving information clarifies the unknown and thus reduces anxiety. The reduction in levels of anxiety then indirectly aids recovery. We call this the information-and-reassurance model. In contrast, viewing patients as potentially active participants in their surgical recovery, we provided a simple set of instruc-

*See also the editorial, "Ileus and Ignorance," by C. L. Witte and M. H. Witte, on pages 532-534 of this issue.

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tions designed to influence specific physiologic responses involved in the recovery from an abdominal procedure.

Support for this model is found in Olness and coworkers.[19] They found that children who received relaxation training and specific instructions for enhancing the production of immunoglobulins (S-IgA) had a notable increase in IgA levels from baseline. Two other groups of children, however, one that learned relaxation and received passive instructions to increase the amount of immune substances in saliva as they wished and one that received equal attention time without any instruction, did not show an increase in immunoglobulin levels. Only direct and specific instructions led to the physiologic change.

The evidence supporting the idea that bowel motility can be consciously influenced and that direct instructions can alter specific physiologic functioning indicates that an intervention given during a preoperative preparatory interview could speed the resolution of postoperative ileus.

Patients and Methods

Subjects

A clinical gastrointestinal nurse specialist selected 40 patients from a pool of presurgical patients on the gastrointestinal surgical service at the University of California, Davis, Medical Center in Sacramento, California. These patients met the following criteria:

- Scheduled for a major elective intraperitoneal surgical procedure not requiring postoperative endotracheal intubation and ventilation and expected to have a postoperative ileus.
- No previously diagnosed neurologic disease or deficit or previous psychiatric diagnosis or disease, including alcoholism and drug abuse.
- Preoperatively, no active diagnosis of any of the major determinants of gastrointestinal dysfunction that may be related to the onset or prolongation of adynamic ileus, such as sepsis, shock, cardiac disease, traumatic injury, respiratory tract infection, renal failure or uremia, hypokalemia, hyponatremia, porphyria, hypochloremia, hypomagnesemia, heavy metal poisoning, retroperitoneal hematoma, or pancreatitis.
- Age 18 to 65 years.
- English speaking.

Patients being consecutively admitted were asked to participate in the study. Five patients refused, and their rate of recovery was not monitored.

Procedure

Approval was obtained for a study using human subjects. After an introduction, patients were told that the study was designed to help speed their recovery. Following informed consent, a ten-minute interview was conducted in which information was collected to personalize the instructions for each patient. Finally, the patients were randomly allocated to hear one of two 5-minute presentations that were matched for length, either control instructions and reassurance or specific physiologic instructions for resolving ileus. All were told that their recovery depended in part on how well they responded to the instructions.

Patients in the control group received instructions unrelated to gastrointestinal motility to compare the results of specific instructions with those of an intervention of equal duration. These patients were told of the importance of postoperative deep breathing using the bedside spirometer. Patients in the experimental group received specific instructions for resolving ileus (Figure 1). The same script was read to each patient in a natural and motivating tone of voice by one experimenter (E.A.D.). During both conditions, personal information such as favorite food, friends, and family were included in the suggestions and instructions, and general questions and concerns were addressed. All interviews took place no more than three days before the operation, either in the outpatient clinic or in a patient's hospital room.

> Because you need to eat food to bring nutrients to your body, it is important that your stomach and intestines begin to move as soon as possible after your operation. Abdominal operations cause your stomach and intestines to stop moving for a short time. In your case, this will be kept to a minimum because you will be very relaxed and comfortable. Your stomach will pump and gurgle, and you will become very hungry soon after the operation. Therefore, your stomach and intestines will begin to move and churn so that you can eat [favorite food from earlier in interview] soon after the operation.

Figure 1.—The patients in the study group were given these suggestions for the return of gastrointestinal motility.

To avoid any surgical or postoperative bias, none of the surgeons were informed that a study was taking place, and they were therefore blind to the patient's group. All postoperative data were collected by nurses who were blind to the patient's group. To assess the resolution of postoperative ileus, postoperative data included the time of the first passage of flatus. Self-reported information was used to collect data on the time to first flatus based on the work of Yukioka and co-workers, who compared the time to first flatus as noted by the patient and as recorded by a carbon dioxide analyzer, and determined that self-reports were accurate.[20]

The postoperative interview was identical for both conditions and was conducted only after ileus was resolved and the patient had started taking clear liquids. The postoperative interview consisted of inquiries about the patient's surgical and anesthetic experiences, present condition, and presence or absence of postoperative nausea and vomiting. The Stanford Clinical Hypnosis Scale was also used in the postoperative interview to assess hypnotic ability as it might relate to responsiveness to suggestion.[21]

Other medical recovery data included the time of the return of bowel sounds and the time to first taking clear liquids, length of hospital stay, and how long a nasogastric tube was in place, if applicable. Length of hospital stay was defined as the time from the end of the operation to the time of the physician's discharge orders. Intraoperative, recovery, and total amounts of narcotics were also recorded because these opiates may inhibit bowel function. A history of abdominal operations, the duration of the operation, and an estimate of intraoperative bowel manipulation were also noted as possible contributors to the duration of ileus.

Results

In all, 15 women and 5 men received instructions for the rapid return of gastrointestinal functioning, and 14 women and 6 men received the control instructions and reassurance. The two groups did not differ in demographic data (Table 1).

TABLE 1.—*Demographic Data for Subjects in the Suggestion and Control Groups*

	Suggestion Group		Control Group	
Variable	*Mean*	*SD*	*Mean*	*SD*
Age, yr	46.6	15.0	49.9	15.6
Height, cm	166.9	6.9	165.9	8.4
Weight, kg	73.2	20.9	78.8	26.5
Length of operation, hr	4.2	2.7	3.7	2.6
Previous abdominal operations, No.	1.4	1.8	2.4	1.7
Postoperative narcotics, mg*	108.7	117.5	87.0	67.5
SHCS scores	1.7	1.5	1.3	1.2
Time to 1st passing flatus, hr	62.1	39.2	100.1	59.6

SHCS = Stanford Hypnosis Clinical Scale

*The potencies of all pain medications were converted to morphine equivalents.

The time to the first passage of flatus was used as a measure of the resolution of ileus instead of the time to the first bowel sounds because it is a more reliable indicator of the return of coordinated bowel motility.[20] One-way analysis of variance revealed a significant difference between suggestion groups ($F[1, 38] = 5.63$, $P < .05$). The mean time to first flatus for patients who received instructions was 2.6 days (SD 1.6) compared with 4.2 days (SD 2.4) for controls.

This was a prospective study conducted in a randomized manner. Several factors have been previously identified as contributors to the duration of postoperative ileus. As would be expected, randomization distributed patients with these various characteristics evenly to the suggestion and control groups. These factors were identified as covariates and statistical analysis done to clarify their significance and ensure that a statistical aberration had not occurred. Statistical significance of the suggestion condition was found both with randomization alone and after the effects of the various covariates had been corrected. Some of the covariates included the Stanford Clinical Hypnosis Scale scores, duration of operation, amount of narcotics given intraoperatively and in the recovery room, and degree of bowel manipulation. The amount of narcotics given postoperatively was also analyzed as a possible covariate. Because subjects received several different types of narcotics intraoperatively and postoperatively, it was necessary to convert them all to a similar scale for the analysis. The potencies of all the pain medications were converted to morphine equivalents because equal potencies yield equal side effects.[22]

An independent surgeon who was blind to the patient-intervention group ranked the degree of intraoperative bowel manipulation and peritoneal irritation on a scale from 1 to 6 (Table 2). A score of 1 was assigned to a case when the peritoneal cavity was not entered, as in a properitoneal hernia repair. A score of 2 was given to cases in which the abdomen was opened but little bowel manipulation occurred, as in an uncomplicated open cholecystectomy. A rank of 3 was given when a moderate amount of bowel manipulation occurred. This included cases where several repositionings were required or a limited number of adhesions were taken down, such as a total abdominal hysterectomy with bilateral salpingo-oophorectomy. The rank of 4 was assigned when extensive bowel manipulation occurred. These were cases in which the patient was eviscerated for an extended period or one of the earlier-mentioned operations where extensive lysis of adhesions was required. The rank of 5 was assigned to cases in which a short segment of small bowel was resected or a cyst gastrostomy formed. The rank of 6 was given in cases where an extensive resection was done. This included colon resections and extensive small bowel resections with Roux-en-Y gastrojejunostomies.

TABLE 2.—*Subject Distribution for Ranking of Intraoperative Bowel Manipulation*

	Cases per Group, No.	
Rank of Intraoperative Bowel Manipulation	*Suggestion*	*Control*
1 Abdomen unopened	0	1
2 Limited bowel manipulation	5	2
3 Moderate bowel manipulation	6	3
4 Extensive bowel manipulation	2	6
5 Limited bowel resection	2	3
6 Extensive bowel resection	5	5

In an analysis of covariance, only the rank of intraoperative bowel manipulation and amount of postoperative narcotics were correlated with the dependent variable (time to first flatus) sufficiently to act as covariates ($r[39] = .58$, $P < .01$; $r[39] = .37$, $P < .05$, respectively). After adjustment for its correlation with the amount of postoperative narcotics and rank of intraoperative bowel manipulation, patients in the suggestion group differed significantly from controls with regard to the first passage of flatus ($F[1, 36] = 7.0$, $P < .05$). Table 3 contains the observed means for the time to the first passage of flatus and the means after adjustment for the covariates.

The data on the time of first taking clear liquids and the duration of nasogastric tube placement were similarly analyzed. Analyses of covariance were done with the

TABLE 3.—*Mean Time (in hours) of All Recovery Variables Before and After Adjusting for Amount of Postoperative Narcotics and of Intraoperative Bowel Manipulation*

	Suggestion Group		Control Group	
Variable	*Adjusted, Mean hr*	*Observed, Mean hr*	*Adjusted, Mean hr*	*Observed, Mean hr*
Time to 1st postoperative bowel sounds	29.4	29.5	45.5	45.6
Time to 1st postoperative flatus	63.6	62.1	98.5	100.1
Time to 1st postoperative clear liquid meal	86.9	83.4	115.6	119.1
Duration NG tube in place	59.2	57.5	75.0	76.6
Hospital stay	167.4	157.6	185.2	195.0

NG = nasogastric

time to first taking clear liquids or duration of nasogastric tube placement as the dependent variable, instruction condition as the independent variable, and postoperative narcotic intake and rank of bowel manipulation as the covariates.

After adjustment for correlation with the covariates, the mean time to first taking clear liquids was 3.5 days (SD 1.7) for the experimental group compared with 5.0 days (SD 3.5) for controls. This trend was in the desired direction, but it was not statistically significant ($F[1, 36] = 2.82$, $P = .10$). The mean duration of nasogastric tube placement for the suggestion condition was 2.5 days (SD 2.8), and the mean for the control condition was 3.1 days (SD 3.4). Again, the difference between these two means was not statistically significant ($F[1, 36] = .80$, $P > .05$), but the trend was in the desired direction. It should be noted that a nasogastric tube had to be reinserted in two patients, one in each group, and no differences were detected between groups regarding frequency of nausea and vomiting.

The length of hospital stay was also analyzed using an analysis of covariance, with the estimate of bowel manipulation as the covariate. The experimental condition had a mean duration of stay of 6.6 days (SD 7.2) compared with 8.1 days (SD 5.3) for controls. This difference was not statistically significant ($F[1, 37] = .60$, $P > .05$).

The Stanford Clinical Hypnosis Scale scores had a nearly significant negative correlation with time to first passage of flatus ($r[39] = -.32$, $P = .05$). Subjects with a shorter duration of ileus scored somewhat higher on the scale. This finding is consistent with past research reviewed by Wadden and Anderton, who concluded that hypnotic ability is positively related to the effectiveness of treatment of involuntary physiologic variables, such as pain, warts, and asthma.[23]

To ascertain if hypnotic ability was necessary for the instructions to be effective, a multiple analysis of covariance was done to determine whether there was a significant interaction between experimental condition and Stanford Clinical Hypnosis Scale scores. The time to first passage of flatus was used as the dependent variable, and the amount of postoperative narcotics and rank of intraoperative bowel manipulation were again the covariates. Experimental condition and Stanford Clinical Hypnosis Scale scores were used as independent variables to ascertain whether there was a significant interaction between the two regarding the determination of time to first flatus. This interaction was not significant ($F[4, 25] = .95$, $P > .05$), indicating that giving suggestions can be effective regardless of patients' susceptibility to suggestion.

Discussion

Verbal instructions before major operations can influence physiologic recovery. Patients who received instructions for the early return of bowel motility had a significantly decreased time to first passage of flatus compared with controls who heard an intervention matched for length and content but without the specific instructions ($P < .05$). The duration of hospital stay was reduced an average of 1.5 days in patients who received the five-minute set of instructions (this difference was not significant, however). Based on a minimum room rate of $800 per day, this difference saved patients in the experimental group an average of $1,200.

The nonsignificant results obtained for the time to first clear liquid intake were probably due to hospital procedure and not specifically to patient recovery. Unlike the time to first flatus, the time to first clear liquid intake is dependent on both a patient's physician and the cafeteria staff. Variable delays occur from the time to first flatus until a physician's orders are written for a clear liquid diet. Furthermore, patients' intake of clear liquid is delayed because they can be served only at meal time. Meal orders are sometimes lost or filled out incorrectly (for example, the patient receives a normal meal instead of a clear liquid meal). These delays compromise the accuracy of this variable as a measure of the rate of patient recovery. The nasogastric tube data were subject to similar inaccuracies.

Although the results for several of the more indirect measures of recovery, such as length of hospital stay, were not statistically significant, the trends were always in the desired direction. The influence of suggestion on these variables did not seem as clear, probably in part because of hospital procedures. A somewhat larger and more homogeneous sample would be necessary before significant levels could be reached.

The lack of interaction between the experimental condition and hypnotic ability scores suggests that these two variables are independent. That is, the instructions and the context in which they are received are important regardless of a patient's susceptibility to suggestion. Therefore, all patients can benefit to some degree from suggestions that are given in a believable context.

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